



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/644,567	08/20/2003	Scott G. Walton	N.C. 84,613	6607

26384 7590 05/27/2005

NAVAL RESEARCH LABORATORY  
ASSOCIATE COUNSEL (PATENTS)  
CODE 1008.2  
4555 OVERLOOK AVENUE, S.W.  
WASHINGTON, DC 20375-5320

EXAMINER

MCDONALD, RODNEY GLENN

ART UNIT PAPER NUMBER

1753

DATE MAILED: 05/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

mc

## Office Action Summary

Application No.

10/644,567

Applicant(s)

WALTON ET AL.

Examiner

Rodney G. McDonald

Art Unit

1753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 15 March 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-10 and 12-21 is/are pending in the application.
- 4a) Of the above claim(s) 16-21 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 and 12-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

mc

## **DETAILED ACTION**

### ***Election/Restrictions***

Newly submitted claims 16-21 (Group I) is directed to an invention that is independent or distinct from the invention originally claimed (Group II claims 1-15) for the following reasons:

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the apparatus can be used to practice another and materially different process such as sputter deposition of a substrate.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 16-21 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-3, 7-9 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meger et al. "Beam-generated plasmas for processing applications", Physics of plasmas, Volume 8, Number 5 May 2001, pp. 2558-2564 in view of Moseson (U.S. Pat. 3,393,142).

Regarding claim 1, Meger et al. teach a plasma system. (See Abstract) The plasma system has an electron beam source that has a width much larger than its thickness. i.e. A thin ( about 2 cm) sheet plasma with a large area (i.e. width). (See Page 2563) The average electron energy is from 1-5 KeV. (See Abstract) A gas is provided such as argon, nitrogen, or oxygen. A pair of Helmholtz field coils confines the beam. (Page 2559) The temperature of the plasma can be 1 eV. (See Abstract) As to the "capability" of the apparatus working in 10 mTorr of oxygen since the electron beam is produced in the same apparatus with the same characteristics as required by Applicant's electron beam it is believed the that electron beam source apparatus is "capable" of operating at 10 mTorr of oxygen.

Regarding claim 8, the electron beam source is a linear hollow cathode beam source. (See Fig. 1B)

Regarding claim 9, argon, nitrogen or oxygen can be used. (See page 2559)

Regarding claim 15, the plasma sheet can be  $60 \times 60 \text{ cm}^2$ . (See Abstract)

The difference between Merger et al. and the present claims is that the use of a sputtering target is not discussed (Claims 1, 2), locating a substrate for deposition on is not discussed (Claims 3), the source being select from metals, alloys, semiconductors, or non-conducting materials (claim 7).

With regard to Applicant's claim 1, Moseson teach an apparatus for establishing an ion plasma adjacent an ion target for sputtering of the ion target to form films on a substrate. (Column 1 lines 60-64) With regard to Applicant's claim 1 and considering Figure 4 of Moseson, the apparatus can comprise an electron beam source comprised of a filament 41 guided by a tubular member 32 into the interior of an adaptor 184, which rests on the plate 50. The adaptor 184 has a nozzle 185, which extends in the direction of an anode 181. The tubular member 32 and the adaptor 184 jointly operate to provide a stream of electrons, which issues through the nozzle 185 in a direction substantially parallel to the plate 50. (Column 6 lines 36-43) The configurations of the adaptor 184 and the nozzle 185 are best apparent from Fig. 5 of the drawings. From this figure it will be recognized that the nozzle 185 defines a rectangular aperture 187, which is similar to the previously described aperture 155 shown in Fig. 3. Dotted lines in Fig. 5 indicate the configuration on anode 181. This anode configuration corresponds to the configuration of the aperture 87, so that an approximately prismatic ion plasma

Art Unit: 1753

will be formed between the nozzle 185 and the anode 181 in the absence of a magnetic field. Dotted lines 188 in Fig. 4 are intended to outline this ion sheet. (Column 6 lines 44-55) The apparatus shown in Figs. 4 and 5 has the advantage that the ion plasma sheet is in a horizontal plane. (Column 6 lines 72-74) From Fig. 5 the width of the electrons beam is much large than it's thickness. (See Fig. 5) Considering Figure 4 of Moseson, the plasma sheet exists in the horizontal plane (Column 6 lines 72-74) produced from the electrons and has a width, thickness and length as seen and suggested in Figs. 4 and 5. (See Figures 4 and 5) Considering Figure 4 of Moseson, an electromagnetic coil 193 is positioned to establish parallel field lines and control the plasma and thus the sputtered film density on the substrate. The coil 193 may be movable (Column 6 lines 69-71) in order to effect the uniformity of film thickness on the substrate surface. (Column 4 lines 65-68) The plasma is in a horizontally sheet. (Column 6 lines 72-73) Considering Fig. 4 of Moseson, an ion target 95 is present for depositing a film of coatings on substrates. (Column 6 lines 56-62) Considering Fig. 4 of Moseson, a substrate 190 is present for deposition upon. (Column 6 lines 59-62)

With regards to Applicant's claim 2, the target 95 is connected to battery 102 in order to provide the bias in order to attract ions out of the plasma sheet for sputtering. (Column 6 lines 18-35; Column 6 lines 56-62)

With regards to Applicant's claim 3, the electrical bias is DC bias as shown schematically in Fig. 4. (See Figure 4)

With regards to Applicant's claim 7, the Moseson recognize that metallic elements and many alloys have been sputtered in the prior art (Column 1 lines 24-27)

Art Unit: 1753

and their invention provides an apparatus for depositing those thin film materials.

(Column 1 lines 53-56) A target is used for depositing the films. (Column 6 lines 56-62)

The motivation for utilizing a sputtering target, locating a substrate for deposition and selecting from metals, alloys, semiconductors, or non-conducting materials for deposition in an electron beam apparatus is that it allows for reducing the energy requirements of sputtering operations. (Column 1 lines 50-53)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Meger et al. by utilizing a sputtering target, locating a substrate for deposition and selecting from metals, alloys, semiconductors, or non-conducting materials for deposition as taught by Moseson because it allows for reducing the energy requirement for sputtering operations.

Claims 4, 5, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meger et al. in view of Moseson as applied to claims 1-3, 7-9 and 15 above, and further in view of Oda et al. (U.S. Pat. 3,436,332).

The differences not yet discussed are the substrate being electrically biased is not discussed (claim 4), the electrical bias being DC or RF is not discussed (claim 5) and where the target and the substrate are biased (claim 10).

Oda et al. teach biasing the substrate. The substrate can be biased by a DC electric source or an AC electric source. (Column 3 lines 11-18) Oda et al. further suggest that the target be sputtered by applying a bias voltage as well. (Column 2 lines 70-72; Column 3 lines 1-5)

The motivation for biasing the substrate and utilizing DC or RF sources to bias the substrate is that it prevents electrons from entering the electron guide tube 16. (Column 3 lines 15-18)

The motivation for biasing both the substrate and the target is that it allows for deposition of films. (Column 3 line 5)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have biased the substrate, utilized DC or RF sources to bias the substrate and to have biased both the substrate and the target as taught by Oda et al. because it allows for preventing electrons from entering the electron guide tube and for depositing films.

Claims 6 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meger et al. in view of Moseson as applied to claims 1-3, 7-9 and 15 above, and further in view of Hurwitt et al. (U.S. Pat. 6,416,635).

The differences not yet discussed is the target and the substrate being adjustable is not discussed (claim 6) and a sputtering magnetron being utilized is not discussed (Claim 12).

With regard to Applicant's claim 6, Hurwitt et al. teach that either the target or the substrate can be moved relatively to one another. (Column 5 lines 47-53) Also, Moseson suggest adjusting the beam position by moving the magnet field. (See Moseson discussed above)

The motivation for moving the target and the substrate relative to one another is that it allows for improving uniformity. (Column 6 lines 3-8)



Art Unit: 1753

With regard to Applicant's claim 12, Hurwitt et al. teach that a magnet assembly can be utilized behind the target for confining and enhancing the plasma during sputtering. (Column 6 lines 56-59)

The motivation for utilizing a magnetron is that it allows for confining and enhancing the plasma during sputtering. (Column 6 lines 56-59)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have moved the substrate and target relative to one another and to have utilized a magnetron for confining and enhancing the plasma during sputtering as taught by Hurwitt et al. because it allows for forming uniform films and for confining and enhancing the plasma during sputtering.

Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meger et al. in view of Moseson as applied to claims 1-3, 7-9 and 15 above, and further in view of Bunshah et al. (U.S. Pat. 4,336,277).

The differences not yet discussed are utilizing a vaporization means is not discussed (claim 13) and positioning the electron beam produced plasma between the source material and the substrate is not discussed (claim 14).

With regard to claims 13 and 14, Bunshah et al. suggest placing a vaporization means in a chamber opposite substrates with an electron beam means positioned between the vaporization means and the substrates. (See Figure; Column 3 lines 25-27; Column 56-68)

The motivation for utilizing a vaporization means and locating the electron beam between the source and the substrate is that it allows for producing high quality coatings. (Column 1 lines 35-36)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized a vaporization means and positioned the electron beam produced plasma between the source material and the substrate as taught by Bunshah et al. because it allows for producing high quality coatings.

### ***Response to Arguments***

Applicant's arguments filed 3-15-05 have been fully considered but they are not persuasive.

At the outset it should be noted that Applicant has amended the claims to characterize the electron beam properties which has required new rejections to meet these limitations. The new rejections are set forth above. The Examiner will try best to address applicant's arguments based on the new rejections since the new rejections rely on previously cited art and are believed to be still relevant to the amended claims.

In response to the argument that Meger et al. is not combinable with Moseson because Meger et al. fails to suggest deposition techniques for Meger et al.'s application of electron beams, it is argued that Meger et al. meet Applicant's limitations for an apparatus for producing an electron beam meeting certain required characteristics. Moseson suggest that an electron beam can be utilized for sputtering a target and therefore this suggests the possibility of incorporating a target in Meger et al.

Art Unit: 1753

electron beam plasma apparatus so that a sputtering film can be produced. (See Moseson and Meger et al. discussed above)

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M- Th with Every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 1753

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Rodney G. McDonald  
Primary Examiner  
Art Unit 1753

RM  
May 25, 2005